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ABSTRACT

The performance of Hawaii's students on the College Entrance Examination Board's Scholastic Aptitude Test (SAT) was assessed in the course of a reanalysis of data presented in a 1985 article by E. B. Page and H. Feifs. Separate analyses were conducted on the verbal and math scores used as criterion variables. The predictor variables included the proportion of high school graduates taking the SAT, the proportion of all students who are not Black or Hispanic, student-teacher ratio, teacher salary, per-student expenditure, the proportion of state per-capita income spent on education, average income, and employment rate. Results indicate that, given its resources, Hawaii is the least successful of all the states in preparing its students, regardless of whether they attend private or public school, for higher education. This unfortunate finding is almost wholly can be attributed to student performance on the verbal portion of the SAT; Hawaii's students perform well in relation to other students in the United States on the math portion of the SAT. (TJH)

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College Board Performance: Hawaii, the Least Literate State Relative to Resources

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Kamehameha Schools/Bishop Estate

January 1987

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Abstract

The authors analyze the performance of Hawaii's students on the College Entrance Examination Board's Scholastic Aptitude Test (SAT). When controlling for the proportion of graduating high school students taking the test and other variables hypothesized to influence average State scores, Hawaii ranks 50th among the States in performance on the Verbal portion of the SAT.

Background

The research reported here attempts to assess the educational status of college applicants from Hawaii in comparison to applicants from the other States. There is no entirely satisfactory measure of the relative success of the 50 States in providing education to their populations. No one test is administered universally to all graduating high school students. In looking at educational outcomes across States, the best available measure is the College Board's Scholastic Aptitude Test (SAT).

Despite the fact that the SAT "is not designed to sample curricular attainments of high school seniors nationwide; and the SAT is not administered to random samples of high school seniors" (Womer, 1983, p. 4), the SAT is a high-quality instrument that is administered under carefully managed conditions and scored and processed under rigorous, quality-controlled procedures. Granted that serious problems are associated with its use in comparing the educational success of the States, nothing better is available.

The SAT is not administered to all graduating high school students or to randomly drawn samples of graduating students. The characteristics of students taking the test vary considerably from state to state. These characteristics may be related to test results. Steelman and Powell (1985) suggest adjusting average SAT scores to correct for variation between States in composition of populations taking the SAT. Using 1982-1983 SAT

scores, Steelman and Powell (1985), and Page and Feifs (1985), found that the percentage of students taking the test, sex, race, and average family income are significantly related to State SAT averages. These two reports used the same statistical approach (multiple regression) to analyze average SAT scores, although they used a slightly different set of variables.

In the Steelman and Powell (1985) analysis, the criterion variable was the sum of the SAT Math and Verbal scores. In the Page and Feifs (1985) analysis, the criterion variable was the sum of the Math score plus twice the Verbal score. In these reports, the analyses take into account the sociological characteristics and the proportion of high school students taking the SAT. In both reports Hawaii's corrected rank in SAT Verbal performance among the States was 50. **Hawaii's students performed worse than those from any other State in the nation** (see Table 1).

Historically Hawaii's students have done better on the Math portion of the SAT than they have on the Verbal. In fact, Hawaii had a larger difference between average Math and Verbal SAT scores than any other State in both 82-83 and 83-84 (College Board, 1985). We wanted to see what happened to the ranking of Hawaii when the Verbal and Math scores were analyzed separately.

Table 1

Ranks of States based on corrected and uncorrected scores

State	Page and Feifs				Steelman and Powell	
	Uncorrected Verbal	Uncorrected Math	Uncorrected 2V + M	Corrected 2V + M	Uncorrected V + M	Corrected V + M
Alabama	22.0	27.0	24.0	20.0	26.0	24.0
Alaska	29.0	33.0	30.0	44.0	29.0	34.5
Arizona	19.0	23.0	21.0	33.0	20.0	34.5
Arkansas	18.0	14.0	13.0	17.0	12.5	45.0
California	43.0	30.0	39.0	34.0	33.0	22.5
Colorado	21.0	18.0	19.0	27.0	18.0	10.0
Connecticut	32.0	37.0	33.0	2.0	35.5	26.0
Delaware	34.0	36.0	34.0	12.0	34.0	12.0
Florida	42.0	39.0	41.0	38.0	38.5	20.5
Georgia	49.0	49.0	49.0	45.0	49.0	36.0
HAWAII	47.0	31.0	47.0	50.0	47.0	50.0
Idaho	14.0	19.0	16.0	39.0	15.0	39.0
Illinois	24.0	15.0	22.0	21.0	21.0	14.0
Indiana	46.0	46.0	46.0	43.0	46.0	42.0
Iowa	2.0	1.0	1.0	3.0	1.0	5.5
Kansas	4.0	4.0	4.0	14.0	4.5	15.5
Kentucky	16.0	16.0	15.0	31.0	17.0	47.0
Louisiana	18.0	24.0	18.0	19.0	22.5	37.5
Maine	37.0	42.0	38.0	41.0	37.0	30.0
Maryland	36.0	38.0	35.0	11.0	38.5	1.0
Massachusetts	35.0	40.0	36.0	7.0	40.5	33.0
Michigan	26.0	17.0	25.0	24.0	24.0	13.0
Minnesota	13.0	9.0	9.0	37.0	7.0	26.0
Mississippi	15.0	21.0	17.0	8.0	16.0	30.0
Missouri	20.0	20.0	20.0	36.0	22.5	19.0
Montana	35.0	7.0	7.0	18.0	6.0	2.5
Nebraska	6.0	5.0	6.0	26.0	4.5	2.5
Nevada	30.0	28.0	29.0	48.0	30.0	43.0
New Hampshire	28.0	29.0	28.0	9.0	28.0	8.5
New Jersey	44.0	45.0	44.0	6.0	44.0	37.5
New Mexico	9.0	11.0	10.0	1.0	14.0	30.0
New York	40.0	34.0	40.0	4.0	35.5	5.5
North Carolina	48.0	48.0	48.0	49.0	48.0	30.0
North Dakota	5.0	3.0	3.0	25.0	3.0	30.0
Ohio	27.0	25.0	27.0	30.0	27.0	18.0
Oklahoma	11.0	12.0	12.0	42.0	11.0	44.0
Oregon	33.0	32.0	32.0	29.0	31.0	20.5
Pennsylvania	39.0	43.0	42.0	23.0	42.0	22.5
Rhode Island	41.0	44.0	43.0	16.0	43.0	40.0
South Carolina	50.0	50.0	50.0	46.0	50.0	41.0
South Dakota	1.0	2.0	2.0	5.0	2.0	5.5
Tennessee	10.0	13.0	11.0	10.0	12.5	17.0
Texas	45.0	47.0	45.0	47.0	45.0	48.0
Utah	3.0	8.0	5.0	13.0	8.0	46.0
Vermont	31.0	35.0	31.0	22.0	32.0	15.5
Virginia	38.0	41.0	37.0	15.0	40.5	8.5
Washington	25.0	26.0	26.0	32.0	19.0	5.5
West Virginia	23.0	22.0	23.0	40.0	25.0	49.0
Wisconsin	17.0	10.0	14.0	28.0	10.0	11.0
Wyoming	8.0	6.0	8.0	35.0	9.0	26.0

Note. The data in columns 2 through 5 are from Page and Feifs (1985) p. 308. The data in columns 6 and 7 are from Steelman and Powell (1985) p. 605.

Methods

The data presented in the Page and Felfs (1985) article were reanalyzed. Separate analyses were conducted with Verbal and Math scores used as criterion variables.

The predictor variables presented in the Page and Felfs (1985) article and used in our reanalysis were:

(1) proportion of High School graduates taking the SAT;

(2) proportion of all students in State who are not Black or Hispanic;

(3) pupil-teacher ratio;

(4) teacher salary;

(5) per-pupil expenditure;

(6) the proportion of State per-capita income spent on education;

(7) average income; and,

(8) employment rate for the State (1 - proportion of population unemployed).

We added to the multiple regression equation, the average uncorrected Math score as a predictor of the Verbal score and the average uncorrected Verbal score as a predictor of the Math score. The rationale for including performance on one portion of the SAT as a predictor for the other was that this controlled for variation not unique to verbal or math skills (e.g. test-wiseness).

The residuals reported in Table 2 show how much better or worse the students in a State performed than would be expected

based on the multiple regression solution. The ranks reported in Table 2 are based on the size and direction of the residuals. Pearson correlation coefficients among the criterion and predictor variables are shown in Table 3.

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Table 2

State residuals and ranks on Verbal and Math portions of the SAT (1982-1983)

State	Residual Verbal Score	Residual Verbal Rank	Residual Math Score	Residual Math Rank
Alabama	1.29	21	-0.47	26
Alaska	10.32	3	-13.03	50
Arizona	8.95	4	-8.56	46
Arkansas	-2.58	36	2.97	18
California	-6.18	41	6.65	6
Colorado	5.57	12	-6.24	44
Connecticut	8.68	5	-2.76	33
Delaware	4.79	13	-2.67	32
Florida	-2.60	37	-0.87	28
Georgia	-1.84	32	-3.61	36
HAWAII	**-25.74**	**50**	**23.06**	**1**
Idaho	11.41	2	-9.34	47
Illinois	-7.00	42	5.33	8
Indiana	-6.07	40	3.13	17
Iowa	-0.20	27	4.43	11
Kansas	2.08	20	-2.90	34
Kentucky	6.66	8	-5.60	40
Louisiana	3.42	16	-3.80	37
Maine	-0.91	29	0.73	23
Maryland	4.57	15	-1.95	30
Massachusetts	4.59	14	-0.77	27
Michigan	-7.81	46	9.26	2
Minnesota	-7.45	45	4.63	10
Mississippi	2.84	17	0.99	22
Missouri	-2.31	34	-2.28	31
Montana	-7.02	43	5.28	9
Nebraska	-9.20	48	7.95	5
Nevada	0.39	23	-3.29	35
New Hampshire	2.50	18	2.87	19
New Jersey	-1.32	31	4.00	12
New Mexico	5.94	11	2.16	21
New York	-2.33	35	8.38	4
North Carolina	0.96	22	-6.14	43
North Dakota	-7.09	44	9.15	3
Ohio	-5.59	39	3.65	15
Oklahoma	6.02	10	-10.79	49
Oregon	7.60	6	-10.56	48
Pennsylvania	2.36	19	-4.09	38
Rhode Island	6.08	9	-6.59	45
South Carolina	-8.30	47	2.43	20
South Dakota	0.29	25	3.75	14
Tennessee	0.10	26	6.18	7
Texas	-0.62	28	-6.01	41
Utah	14.56	1	-6.04	42
Vermont	0.37	24	-1.92	29
Virginia	-1.96	33	3.98	13
Washington	7.42	7	-5.23	39
West Virginia	-9.42	49	3.40	16
Wisconsin	-4.95	38	0.43	25
Wyoming	-1.25	30	0.72	24

Table 3

Pearson correlation coefficients

	Criterion Variables	
Predictor Variables	Verbal Score	Math Score
Verbal score	----	0.97*
Math score	0.97*	----
Proportion of High School graduates taking the SAT	-0.84*	-0.85*
Proportion of all students in State who are not Black or Hispanic	0.35*	0.38*
Pupil-teacher ratio	-0.19	-0.17
Teacher salary	0.25	0.14
Per-pupil expenditure	-0.18	-0.11
The proportion of the per-capita income spent on education	0.11	0.09
Average income	-0.20	-0.12
Employment rate for the State (1 - proportion of population unemployed)	0.13	0.17

* $p < 0.01$

Results

The multiple regression equations accounted for 96 percent of the variation in the Verbal score and 97 percent of the variation in the Math score (both results are significant at the 0.0001 level). Hawaii's average Verbal score was more than 25 points below the score predicted by the regression equation (-3.73 standard errors, $p<0.01$). Hawaii's residual Verbal rank among the States was 50. This finding is consistent with the results reported by Steelman and Powell (1985) and Page and Feifs (1985). When performance on the Math portion of the SAT is examined, the finding is very different. Hawaii's average Math score was 23 points above that predicted by the regression equation (+3.59 standard errors, $p<0.01$). For the Math portion of the SAT Hawaii's residual rank was 1. The graphic presentations of uncorrected vs. residual scores in Figures 1 (Verbal) and 2 (Math) demonstrate the dramatic difference in Hawaii's students' performance on the two portions of the SAT.

While the uncorrected average Math score for Hawaii is not in itself remarkable (Rank = 31) (see Table 1), the fact that Hawaii's students can do so well on the Math portion of the test is in striking contrast to what happens on the Verbal portion.

The Pearson correlations among the criterion and predictor variables are strongest for "proportion of High School graduates taking the SAT". This factor alone explains 71 percent of the variation among States in Verbal scores and 72 percent of the variation among States in Math scores. However, Hawaii is not an

extreme case on this variable. Fifteen States had a higher proportion of students taking the SAT (U.S. Department of Education, 1986) and 13 of these 15 States had a higher average uncorrected Verbal score.

FIGURE 1. PLOT OF STATE RESIDUAL VS. UNCORRECTED VERBAL SCORES

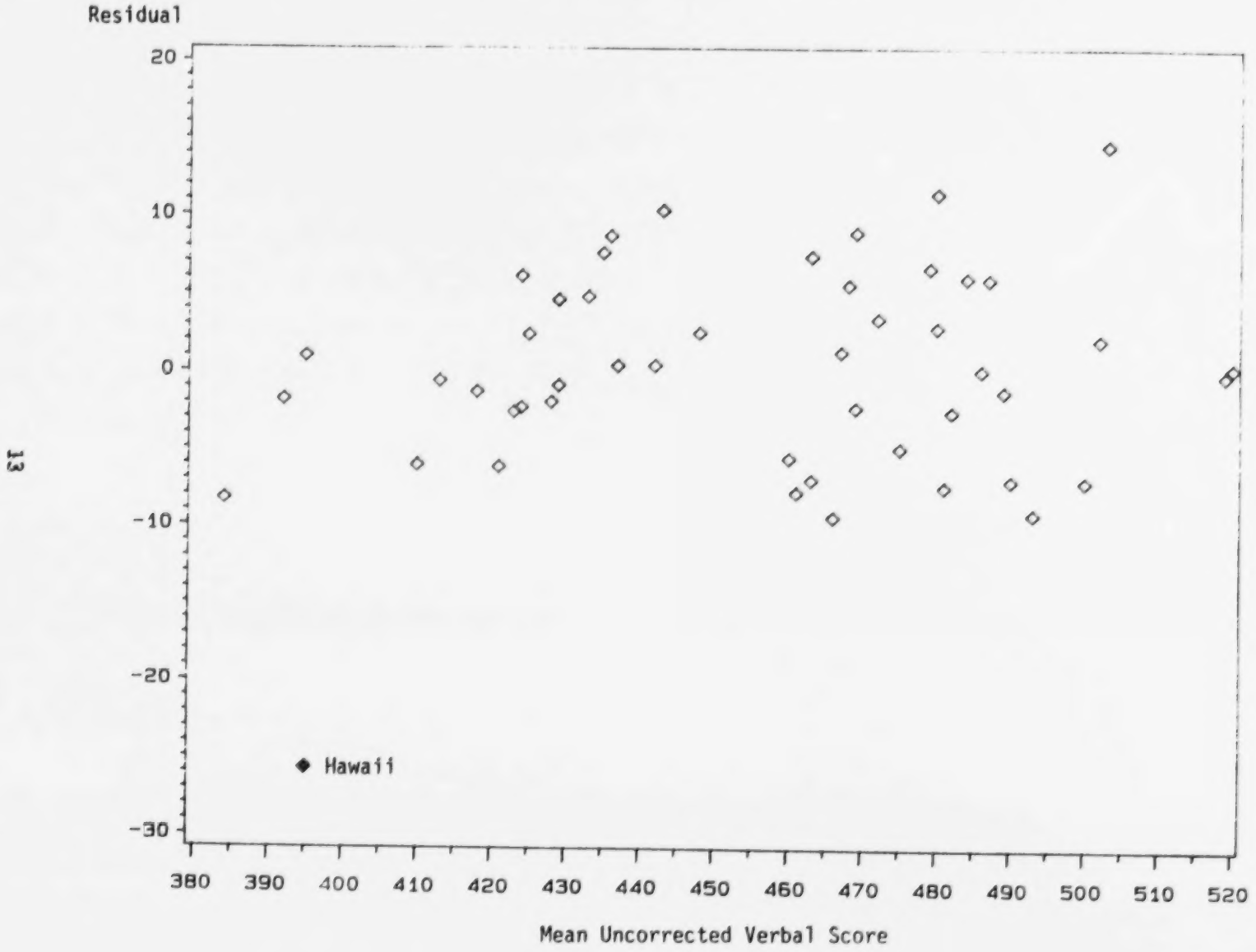
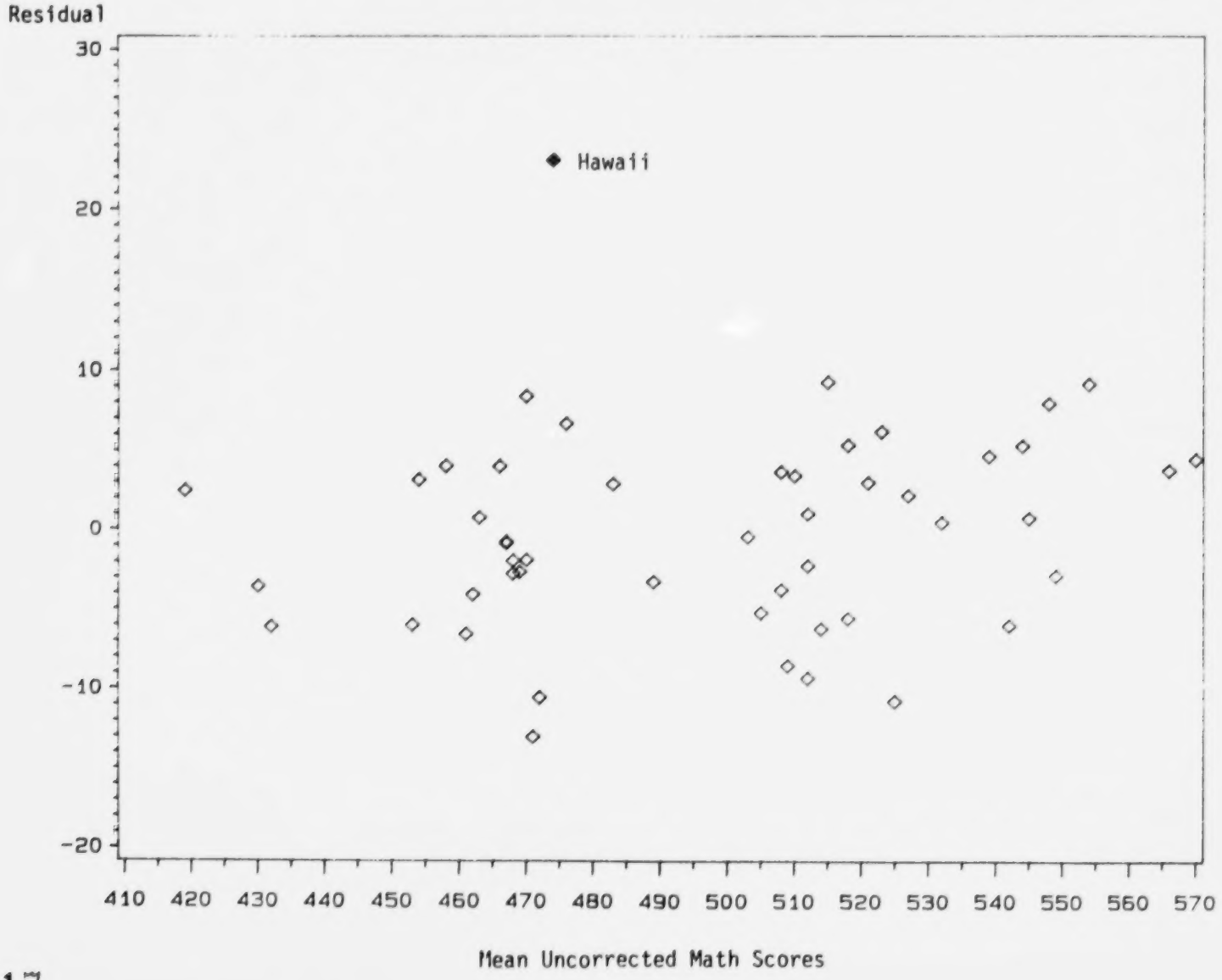


FIGURE 2. PLOT OF STATE RESIDUAL VS. UNCORRECTED MATH SCORES



Discussion

The analyses reported by Steelman and Powell as well as those reported by Page and Felfs suggest that, given its resources, Hawaii is the least successful of all the States in preparing its student population for higher education. These findings come from independent teams of researchers, reported in two different national professional journals. These data include students who attend private as well as public high schools.

Our analyses of these data, separating Verbal and Math scores, confirm these findings but reveal that the dismal ranking of Hawaii among the States is due entirely to the extremely poor performance of Hawaii's students on the Verbal portion of the College Board SAT. In fact, Hawaii's students perform well in relation to students from other States on the Math portion of the SAT.

In local public and political discussion, concern about the poor showing of Hawaii on the SAT has been countered by the argument "The results are misleading because such a high proportion of high school graduates in Hawaii take the SAT." The results found here contradict that argument. In 1982-83, 13 of the 15 States with a higher proportion of high school graduates taking the SAT than Hawaii, had higher Verbal scores. Further, the analyses reported here (both our own and the reports cited) statistically control for this effect. Also, one might ask "If <u>proportion-taking</u> is the determining factor, why does it not adversely influence the SAT Math performance?"

There have been several historical and social conditions suggested to explain why the Verbal performance of Hawaii's students is so dramatically poor (especially in relation to Math scores and to the available resources). The simple unwillingness of educational policy makers to acknowledge that the problem exists is, by itself, a necessary condition for the problem to persist.

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